MASTER

DUQUESNE LIGHT COMPANY
SHIPPINGPORT ATOMIC POWER STATION

TEST RESULTS
DLCS 2130102
T-641124

MODIFIED PURIFICATION SYSTEM PERFORMANCE TEST

CORE I, SEED 2

Section 1 of 3 Sections

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CORE I, SEED 2

Purpose

To establish an operating procedure for flushing water through a Purification System demineralizer that has been out of service for an extended period of time and to determine if the demineralizer is satisfactory for placing in service.

Conclusions

The method for flushing the demineralizer as described in the Test Procedure proved to be satisfactory except that difficulty was encountered in controlling the reactor coolant water pressure during the flushing operations. This was caused by the reactor coolant water flowing into the flash tank at a faster rate than the charging pumps could charge water into the System. This condition could be eliminated by using the 40 gpm orifice at the inlet to the flash tank instead of the 50 gpm orifice previously used and cycling one of the charging pumps to maintain System pressure during the test instead of throttling the flow of water to the flash tank.

Since the temperature of the reactor coolant water was less than 200 F, there was no need to circulate the water through either heat exchanger for warm-up prior to flushing the demineralizer. Therefore there is no apparent need for using part of the Core Removal Cooling System for flushing the demineralizer as specified in the Test Procedure.

The average decontamination factors for the demineralizer were 4.0 and 9.3 for the first and second flushings respectively, indicating that the resin was not exhausted. The specific activity of Cs-137 was lower in the effluent than in the influent indicating that the demineralizer was not releasing activity to the reactor coolant and was satisfactory for returning to service.

Description of Test Equipment and Test Procedure

The Purification System was set up for modified core removal cooling by using part of the Core Removal Cooling System as shown in Figure 1. With the 1D reactor coolant pump on slow speed and flow established through the modified Purification System, the drain valve (09-H16-12) was opened allowing the reactor coolant water to flow through the demineralizer and into the flash tank via the 50 gpm orifice. During the first flushing operation, approximately 1000 gallons of water were discharged to the flash tank.

Due to a strong resinous odor detected in the demineralizer effluent samples, the demineralizer was flushed a second time with approximately 2000 gallons of water.

Samples of the demineralizer influent and effluent were obtained prior to, after, and at regular intervals during the flushing operation to determine if the demineralizer was satisfactory for service. The results proved satisfactory and after

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the second flushing operation, the IBD demineralizer was placed in service.

Results

On April 17, 1960, the IBD purification demineralizer was flushed with reactor coolant water using the modified Purification System as shown in Figure 1. The purpose of the flushing operation was to check the performance of the resin as determined by its ability to remove gamma activity and fission products from the reactor coolant water after being out of service for approximately six months due to refueling operations. All flushing operations were carried out with the Reactor Coolant System temperature below 200 F and pressure between 400-500 psig.

During the first flushing operation, the influent and effluent were sampled every 5 minutes. The gross gamma activity of all the samples was determined by using a 1 3/4" x 2" Well type NaI(Tl) crystal with a scaler biased to accept pulses above 30 kev. The influent and effluent samples were also analyzed for Cs-137 activity. The gross gamma activity, Cs-137 activity and the decontamination factors for each sample are listed in Table I. The average decontamination factor was 4.0 for the first flushing as determined by the ratio of the gross gamma activity level entering the demineralizer to the gross gamma activity level at the outlet.

During the first flushing, all effluent samples had a strong resinous odor which was attributed to a partial decomposition of the anion resin into an aliphatic amine. Chemical tests on spot samples did not confirm the presence of any amine in the effluent.

The existence of this odor necessitated a second flushing of the demineralizer, using the same procedure, with approximately 2000 gallons of reactor coolant water on April 21, 1960. Samples were taken at the beginning, middle and end of the flushing operation. The gross gamma activity, Cs-137 activity and the decontamination factors for the second flushing are listed in Table II. The average decontamination factor was found to be 9.3. After the second flushing, the resinous odor was not detectable in the effluent samples.

The gamma spectra of the samples from both flushing operations indicated that the other predominate gamma emitting nuclides present in both the inlet and outlet samples were Co-60 and Mn-54.

The method for flushing the demineralizer as described in the Test Procedure proved to be satisfactory except that difficulty was encountered in controlling the reactor coolant water pressure during the flushing operations. This was caused by the orifice (rated at 50 gpm) at the inlet to the flash tank passing more water than the two charging pumps (rated at 25 gpm each) were capable of charging into the System. In order to maintain the specified pressure of 400-500 psig, considerable time was spent throttling the flow of water to the flash tank to equal the water being charged into the system by the two charging pumps. This condition can be eliminated by using the alternate orifice (rated at 40 gpm) at the inlet to the flash tank, thus restricting the flow to the flash tank to within the capacity of the charging pumps. System pressure can then be maintained by

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cycling one of the charging pumps as necessary.

From the schematic diagram of the modified Purification System shown in Figure 1, it can be seen that there is no apparent need for using part of the Core Removal Cooling System for flushing the demineralizer. Since the reactor coolant water is below 200 F, there is no need to warm up either of the two heat exchangers. Flushing an isolated demineralizer can therefore be accomplished by using only the Purification System without using part of the Core Removal Cooling System as required by the Test Procedure. The IBD purification demineralizer was considered satisfactory for placing in service as indicated by the results in Tables I and II. These data proved the resin was not exhausted and was not releasing activity to the Reactor Coolant System.

The flash tank level and a log of events were recorded during the first flushing operation on April 17, 1960, and is shown in Table III. This information was not recorded for the second flushing.

Figure 1

TABLE I

Chemical Analysis of Samples Obtained During First Flushing
of LBD Demineralizer

	Gross Gamma Activity CPM/ML		Decontamination Factor <u>Influent Gross</u> <u>Effluent Gross</u>	Cs ¹³⁷ Activity DPM/ML	
	Influent	Effluent		Influent	Effluent
Maximum	5025	1091	4.6		
Minimum	219	67	3.3		
Average	838	205	4.1	116	36

TABLE II

Chemical Analysis of Samples Obtained During Second Flushing
of LBD Demineralizer

Date	Time	Sample	Gross Gamma Activity CPM/ML	Decontamination Factor <u>Influent Gross</u> <u>Effluent Gross</u>	CS-137 Activity DPM/ML
4/21/60	1221	Influent	336		139
	1223	Effluent	56	6.5	31
	1316	Influent	591		134
	1317	Effluent	58	10.2	27
	1432	Influent	915		150
	1434	Effluent	87	10.5	21

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TABLE III

Date	Time	Flash Tank Level (inches)	Log of Events During First Flushing Operation
4/17/60	1800	23	Opened valve 09-H16-12 Closed valve 09-H16-12 when Reactor pressure decreased rapidly to 350 psig. Both charging pumps on fast speed, but still losing pressure.
	1802	24	
	1803	23.5	Opened valve 09-H16-12 very slowly, but reactor pressure still dropped rapidly. Difficulty was encountered in maintaining reactor pressure between 400-500 psig limits. Numerous changes in the valve settings had to be made to maintain pressure.
	1902	40	Closed valve 09-H16-12 and valve 09-H16-32.

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